

Animal Damage and Its Control in Ponderosa Pine Forests

Jim Evans



Ponderosa Pine

**the species
and its management**

PONDEROSA PINE THE SPECIES AND ITS MANAGEMENT SYMPOSIUM PROCEEDINGS

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James Evans

ABSTRACT

In this paper, animal damage problems to ponderosa pine regeneration are described. Particular attention is given to a review of the present knowledge of wildlife species causing damage and to current methods and materials available to control the damage. An extensive bibliography of publications on forest animal damage control is presented for those with further interest in the subject. The paper also points out a need for research on wildlife-reforestation interactions in ponderosa pine and other timber types in western United States.

Keywords: reforestation, animal pests, forest pest control, pesticides, conifer (seed, seedling) protection.

INTRODUCTION

Many species of animals injure or destroy ponderosa pine seed, seedlings, and saplings; a few also damage large saw timber¹. The effects of this damage are decreased seed and seedling production, reforestation failures and delays, and reduction of potential timber productivity.

This paper identifies some of the more common birds and mammals causing damage to reforestation of ponderosa pine in western United States, and reviews some of the methods and materials available to reduce this damage. More complete listings of animals affecting ponderosa pine are available (Black, 1970; Cockran, 1970; Hooven, 1970; Pank, 1974; Barrett, 1979). Detailed reports on forest animal damage problems and control in the Pacific Northwest also are available (U.S. Forest Service, 1968; Black, 1969, 1974; Baumgartner *et al.*, 1987). Illustrations of animal damage to conifer seed, seedlings, and trees can be found in publications by Lawrence *et al.* (1961) and Harestad *et al.* (1986).

Use of trade names in this report does not imply endorsement by the U. S. Government. Also, pesticide use and availability varies from state to state; therefore, respective State Pesticide Regulatory Agencies or County Extension Agents should be contacted for pesticide availability and intended use.

DAMAGE TO SEED

In most western states, small mammals, more so than birds, limit the success of conifer seeding programs and adversely affect seed production in tree nurseries and seed orchards.

However, since 1972, direct seeding of ponderosa pine and other conifer tree species for reforestation has drastically declined. Because of this decline, seed depredation by animals is currently more of a local problem and not as region-wide as it once was. Although current economics of seed loss to animals is not known, the loss is presumably quite costly particularly in seed orchards and tree nurseries producing high-valued, genetically superior stock.

Mammals Causing Damage

Deer mice, chipmunks, and golden-mantled ground squirrels consume and destroy conifer seed and commonly cause the most seed loss in ponderosa pine direct seeding programs. Shrews, tree squirrels and several species of ground squirrels add to the problem. In bareroot nurseries established by planting seed, locally abundant populations of ground squirrels and chipmunks can severely reduce seedling production by eating and caching seed. Deer mice and occasionally voles—commonly referred to as meadow mice—also cause problems to containerized plantings in nurseries by eating seed or newly formed germinants with seed hulls still attached.

Birds Causing Damage

A number of seed-eating birds adversely affect ponderosa pine management programs by feeding on sown or fallen seed, seed still in cones, and new germinants with seedcoats still attached. Species that move about and feed in flocks generally cause the greatest problem. Serious problems also can occur from depredation by a relatively few birds in specific locations such as high quality seed production sites.

Some of the species of birds commonly affecting reforestation of ponderosa pine include the junco, Cassin's finch, pine siskin, evening grosbeak, varied thrush, and a host of sparrows, chickadees and other passerines. Seed production in managed stands and seed orchards can be adversely affected by Steller's jays and white-headed woodpeckers. Planted seeds in tree nurseries are most commonly destroyed by mourning doves, quail, finches and some of the species mentioned previously. Migrating doves and blackbirds as well as resident quail also clip off and destroy new germinants with attached seedcoats in pine nurseries.

Controlling Seed Losses

REDUCING SEED LOSSES TO ANIMALS IN ALMOST ALL CONIFER SEEDING PROGRAMS IN WESTERN UNITED STATES REQUIRES PROTECTION OF THE SEED FROM BOTH MAMMALS AND BIRDS. Chemical and non-chemical control methods are available and integrated pest management approaches have been suggested.

1. See checklist for scientific names of plants and animals mentioned in this paper.

Chemical Control

The only federally registered pesticide protecting conifer seed from both mammals and birds is a seed protectant formulation consisting of 0.5% active endrin, 2% thiram (tetramethylthiuram disulfide; TMTD; Arasan), and aluminum pigment; some states also require such treated seed to be colored green. The endrin protects seeds from depredation by mammals; the thiram and coloring agents protect seeds from depredation by birds. Although quite effective on most species of conifers, the endrin protectant on ponderosa pine seed has yielded only mediocre success particularly in spot seeding–reforestation programs. The formulation is toxic to most seed-eating animals and is gradually being phased out by the Environmental Protection Agency. **FOREST LAND MANAGERS SHOULD CHECK STATE REGULATIONS FOR LEGAL USE OF ENDRIN.**

Thiram and anthraquinone are federally registered as non-toxic, forest tree seed protectants for reducing seed loss to birds. Their effectiveness as bird repellents in the western states is questionable. Other chemicals (Lindsey *et al.*, 1974; Fuller *et al.*, 1984; Otis, 1987) have shown promise but are not currently registered for use as conifer seed protectants.

There are several toxic baits available under State Special Local Needs (SLN; 24–C) registration for reducing populations of seed-eating rodents in nurseries and seed orchards. Where allowed, zinc phosphide baits are preferred because of low hazard potential to pets and most wildlife.

Nonchemical Control

Plastic and nylon netting, wire cones, noise makers, scarecrows, and other methods and materials are occasionally used to control seed losses to animals. Some methods such as trapping and removal of depredating birds and mammals can be effective in nursery situations. However, most are too expensive (netting and cones), too short term (scarecrows), or too obnoxious (noise makers) for use in all situations. Other methods such as dogs chained to clearcuts and firecrackers are ineffective.

Integrated Pest Management

Integrated pest management—the use of two or more control methods—appears promising for controlling seed losses to animals, particularly in nurseries. For example, Anthony (1976) reported that normal seed bed fumigation in spring plus rodent-proof fencing resulted in suitable germinant production of ponderosa pine where ground squirrels were a problem. He also recommended adding kill-trapping of ground squirrels and using a seed protectant to repel doves to maximize productivity. Live-trapping and removal also might be used in nurseries where kill-trapping or chemical seed protectants are disfavored.

DAMAGE TO SEEDLINGS AND TREES

In this section, I report on some of the more important mammals influencing management of ponderosa pine in the Pacific Northwest. I emphasize mammals because bird damage to ponderosa pine seedlings and trees is generally quite minor. Detailed descriptions and range of these mammals can be found in Hall and Kelson (1959) or in Ingles (1965). Thorough

discussions of problems and control can be found in references previously cited such as Black (1969; 1974) and Baumgartner *et al.* (1987). General information can be found in Evans (1981; 1987a).

General Overview

Wild and domestic mammals adversely affect ponderosa pine mainly by feeding on and injuring or killing seedlings, saplings, and small trees. Feeding injuries to large trees as well as injury from rubbing, trampling, burrowing, and other animal activity adds to the damage problem.

Animal damage can occur anytime in a rotation period, however, the greatest impact on regeneration occurs during the first couple of years after planting (Black *et al.*, 1979) and after thinning.

Most forest animal damage is tied to artificial regeneration. However, natural regeneration also can be seriously affected, particularly on sites where habitat favors high animal populations or high use by wildlife. For example, natural seedlings in bug-killed forests with an abundance of forbs and pocket gophers can be very vulnerable to damage by pocket gophers.

Removing all regeneration timeframes or making areas biologically unfit for damaging animals (i.e., vegetation eradication) would negate the forest animal damage problem. This is not about to happen because of various laws and mandates; therefore, animal damage control should be an integral part of any timber management program.

Major Pest Species and Their Control

Pocket Gophers

The pocket gopher is a major pest species limiting successful regeneration of ponderosa pine in western United States. It is the number one vertebrate pest on National Forests and constitutes a national economic problem.

Two species of pocket gophers cause almost all of the gopher–reforestation problems; they are the northern pocket gopher in most interior forests and the Mazama pocket gopher in forests located mainly in south central and southwestern Oregon. These small, burrowing rodents start clipping and killing seedlings immediately after planting and also will injure and destroy trees 15 to 20 or more years old (Barnes, 1973; Crouch, 1982). If left uncontrolled, they can virtually destroy a plantation in several years.

Foresters rely heavily on population reduction to control pocket gopher damage to conifers. Strychnine baits are used extensively (Evans, 1987c); other toxicants are available or are being tried (Marsh, 1987). Annual or repeated poisoning programs generally results in saving trees. Single application of bait plus continuous kill-trapping has met with partial success (Crouch and Frank, 1979). One-time baiting or trapping programs seldom meet with success.

Plastic seedling protectors (Anthony *et al.*, 1978), under-planting shelterwood units (Barnes, 1974), and use of herbicides (Barnes, 1974; Crouch, 1979) have been successful in control-

ling damage by pocket gophers. Increasing the stocking levels to offset damage appears promising in certain locales. Other approaches such as use of fumigants and repellents, increasing predator use, and seeding of low preference grass and shrub species have been tried but have resulted in limited or no success. In general, little quantitative information exists on the relationship between pocket gopher control and damage reduction and more information is needed regarding affects of silvicultural practice on pocket gopher populations and damage.

Porcupines

This section summarizes recent information presented by Evans (1987b) on the biology, damage, and control of the western or yellow-haired porcupine.

Porcupines have been a problem in ponderosa pine forests since the early 1900's (Lawrence, 1957). Stands that are 5 to 25 years old seem to receive more damage than newly planted trees or trees that have been commercially thinned. Damage generally occurs over winter and in early spring; however, some sites receive considerable summer damage.

Porcupines commonly damage pines by peeling away the bark to feed on the cambium and sapwood. Seedlings girdled at the base generally die. Saplings, pole-size trees and small saw logs are usually damaged in the upper bole resulting in top kill, multiple tops, loss of potential height growth, and reduced quality of the tree as a saw log. Some stands are severely damaged for 1 or 2 years and left alone. Others may be damaged year after year for a number of years. In some areas occupied by porcupines, damage to trees does not occur. The reason damage does occur in these areas has not been determined.

Population reduction is commonly used to control porcupines. As with gophers, there is no quantitative information relating numbers of porcupines killed with number of trees saved. Shooting is generally the preferred method used to control porcupines; it is done either by trained employees or through contract hunting. Trapping with leg-hold traps, conibear traps, live capture and removal, and poisoning with strychnine are other methods of control. A word of caution—the strychnine salt block registered for porcupines appears to be ineffective in pine forests in western United States (Anthony *et al.*, 1986) and use of leg-hold traps should be scrutinized because of public adversity (Evans, 1987b). There is no proven repellent for porcupines.

Deer and Elk

Mule deer, white-tailed deer, and black-tailed deer as well as Rocky Mountain elk (interior forests) and Roosevelt elk (coastal forests) all feed on and damage ponderosa pine. Trampling, pulling out seedlings, antler rubbing, and bark stripping also seriously affect regeneration when these problems occur. The result of the damage is generally growth suppression and regeneration delays. However, seedlings that are repeatedly browsed, those that are pulled out of the ground, and some that are trampled and are lost from productivity. Girdled and severely stripped saplings also die and are lost from productivity.

In interior forests, damage by deer and elk commonly occurs during the winter and spring months. In coastal forests, it occurs

mainly in the early spring growing season. Young plantations along migration routes as well as those in high use areas such as winter yarding areas can be severely damaged. Harsh winters, lack of alternative food, herd size, and interaction with other wildlife (particularly livestock) all affect intensity and degree of damage to ponderosa pine plantations by deer and elk. Site productivity, slope, elevation, and other factors such as burning also can affect animal use and the intensity and degree of damage.

Foliar repellents such thiram (Scram 42-S; Gustafson 42-S) or putrescent egg products (Big Game Repellent; Deer-Away) have in most cases reduced browsing damage to ponderosa pine to tolerable levels; however, retreatment of seedlings has to be done in areas of repeated browsing to assure repellency. Other methods of control include use of plastic or paper bud cups, individual seedling protectors, fencing, habitat improvement, planting large seedlings, and population reduction through special hunts (Crouch, 1969; Anthony, 1982; Campbell, 1987). Aversive conditioning with repellents found effective for reducing deer damage to Douglas-fir (Campbell *et al.*, 1987) also may have value in protecting ponderosa pine. In some instances (Wolertz, 1987), it may be wise to delay application of big game control measures until damage risks and cost of control have been ascertained. In other instances, such as high valued progeny test sites, any risk of damage may be too great; therefore, even high cost protection such as fencing appears to be justified.

Hares, Rabbits, and Small Rodents

Snowshoe hares, jackrabbits, several species of cottontail rabbits, and many kinds of small rodents such as voles, ground squirrels, tree squirrels, and woodrats clip and destroy young ponderosa pine germinants and seedlings or clip the main stem of seedlings suppressing tree height growth. Stands of young saw timber also can be severely girdled by tree squirrels (Evans, 1981) resulting in substantial loss of productivity.

Thiram animal repellent applied to seedlings before and after planting offers some protection against damage by hares, rabbits, and some rodents. Like other foliar repellents, it has to be reapplied to seedlings subjected to chronic clipping problems. Plastic seedling protectors such as Vexar (Campbell and Evans, 1975) and rabbit-proof fencing (Evans *et al.*, 1982) give long term protection where warranted. Toxic baits with zinc phosphide for rodents and strychnine for jackrabbits and ground squirrels also are available for use where allowed. Fumigating burrows (ground squirrels), sport shooting (tree squirrels, ground squirrels, hares, and rabbits) and trapping (all of the above) are other methods available to control damage to ponderosa pine. In addition, habitat manipulation (Black and Hooven, 1974; Borrecco, 1976) has been used to manage populations of hares, rabbits, and small rodents in or near ponderosa pine plantations.

Cattle and Other Livestock

Cattle, sheep, and occasionally horses, goats, and feral hogs directly or indirectly affect regeneration of ponderosa pine. Some studies (Black, 1970; Evans *et al.*, 1981) indicate that damage by cattle and sheep results mainly from feeding injuries to new growth and from trampling. Some beneficial effects such

as vegetation control by grazing have been noted (Skovlins *et al.*, 1968; Townsend and Guenther, 1981). In southwest Oregon, however, Evans *et al.* (1981) ranked cattle third in importance as damaging agents in ponderosa pine plantations. That study and another by Kingery and Graham (1987) reported that tree growth and stocking levels were more severely suppressed by wildlife in plantations with cattle than in plantations without cattle. For the most part, quantitative data are lacking on the interrelationships between wildlife, sheep, goats, and other livestock and ponderosa pine regeneration. And, little has been done to document the economic impact of livestock and wildlife on pine productivity in many parts of western United States.

Vexar seedling protectors without wooden stakes (Campbell and Evans, 1975) have been used successfully to protect ponderosa pine seedlings from feeding injuries by cattle and other livestock. Staked tubes have been tried but are commonly knocked down by livestock resulting in seedlings being pinned to the ground and an eventual adverse affect on seedling growth. Staking should therefore be avoided. Permanent lightweight electrical and nonelectrical fencing (Mealey, 1969; Larson *et al.*, 1979; Kraft, 1987) also have been used to exclude livestock from ponderosa pine plantations. The best solution to cattle and other livestock problems appears to be to prohibit or limit grazing in plantations that are vulnerable to severe direct or indirect damage by livestock.

DISCUSSION AND CONCLUSION

Animal damage is one of the major factors influencing productivity of ponderosa pine in western United States. Quite often it is the principal factor limiting plantation establishment. It also has a severe impact on growth and yield predictions.

There is an astonishing lack of knowledge of the interrelationships and interactions of wild animals with other factors affecting productivity and management of ponderosa pine. For example, little is known regarding the response of wildlife and impact of wildlife on regeneration under various cutting and reforestation regimes. The relations between numbers of animals and the amount of damage is not known. Studies to determine interactions between cattle, big game, rodents, and ponderosa pine regeneration have just begun. Studies defining relationships between problems species and silvicultural practices are needed.

There is also lack of knowledge of why certain species or certain populations of wildlife cause damage in one place and not another. For example, we know that bears do considerable damage to ponderosa pine in natural areas such as Yellowstone Park and to commercially valuable conifers such as lodgepole pine, larch, Engleman spruce, and Douglas-fir in many parts of the West; yet, there is no published information available on bears seriously affecting productivity of ponderosa pine in commercial forests. Bears are a serious problem elsewhere (Baumgartner *et al.*, 1987). Why not in ponderosa pine stands? In addition, why aren't pocket gophers a problem to ponderosa pine in the Rockies? And, why do large populations of deer and other species of animals use certain plantations but cause relatively little damage to trees?

In conclusion, there is a dire need for a better understanding of animal damage problems in ponderosa pine management programs and other tree management programs in western United States. As stated previously, intensive studies of cattle grazing and wildlife-habitat relations in eastern Oregon have begun. We need similar studies on control of major pest species such as pocket gophers and porcupines. We also need to know what happens in mixed conifer stands, stands that are clearcut, stands that are partially cut, and stands that are thinned and fertilized. This knowledge is necessary for sound biological prescriptions for proper management of ponderosa pine and other tree species in the West.

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LIST OF PLANTS AND ANIMALS

COMMON NAME	SCIENTIFIC NAME OR FAMILY
<u>Plants:</u>	
Douglas-fir	<i>pseudotsuga menziesii</i> (Mirb) Franco
Larch	<i>Larix</i> sp.
Pine, lodgepole	<i>Pinus contorta</i> Dougl.
Pine, ponderosa	<i>Pinus ponderosa</i> Laws.
Spruce, Engelman	<i>Picea engelmannii</i> Parry ex Engelm.
<u>Mammals:</u>	
Bears	<i>Ursus</i> sp.
Chipmunks	<i>Tamias</i> sp.
Deer	<i>Odocoileus</i> sp.
Deer, black-tailed	<i>Odocoileus hemionus columbianus</i>
Deer, mule	<i>Odocoileus hemionus</i>
Deer, white-tailed	<i>Odocoileus virginianus</i>
Elk, Rocky Mountain	<i>Cervus elaphus canadensis</i>
Elk, Roosevelt	<i>Cervus elaphus roosevelti</i>
Ground squirrels	<i>Spermophilus</i> sp.
Ground squirrel, golden mantled	<i>Spermophilus lateralis</i>
Hares	<i>Lepus</i> sp.
Hares, snowshoe	<i>Lepus americanus</i>
Jackrabbits	<i>Lepus californicus</i> ; <i>L. townsendi</i>
Mice, deer	<i>Peromyscus maniculatus</i>
Pocket gophers	<i>Thomomys</i> sp.
Pocket gophers, mazama	<i>Thomomys mazama</i>
Pocket gophers, northern	<i>Thomomys talpoides</i>
Porcupines	<i>Erethizon dorsatum</i>
Rabbits, cottontail	<i>Sylvilagus</i> sp.
Shrews	<i>Sorex</i> sp.
Squirrels, tree	<i>Sciurus</i> sp.; <i>Tamiasciurus</i> sp.
Voles	
(meadow mice)	<i>Clethrionomys</i> sp.; <i>Microtus</i> sp.
Woodrats	<i>Neotoma</i> sp.
<u>Birds:</u>	
Blackbirds	<i>Euphagus</i> sp.
Chickadee	<i>Parus</i> sp.
Doves, mourning	<i>Zenaidura macroura</i>
Finches	<i>Carpodacus</i> sp.
Finch, Cassin's	<i>Carpodacus cassinii</i>
Grosbeak, evening	<i>Coccothraustes vespertina</i>
Jay, Steller's	<i>Cyanocitta stelleri</i>
Junco	<i>Junco hyemalis</i>
Pine siskin	<i>Carduelis pinus</i>
Quail	<i>Lophortyx californicus</i> ; <i>Oreortyx pictus</i>
Sparrows	<i>Spizella</i> sp.; <i>Zonotrichia</i> sp.
Thrush, varied	<i>Zoothera naevia</i>
Woodpecker, white-headed	<i>Picoides albolarvatus</i>
<u>Domestic and Feral Animals:</u>	
Cattle, sheep, horses, feral hogs, etc.	
Bovidae: Equidae, Suidae	